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III. *Additional facts respecting the fossil remains of an animal, on the subject of which two papers have been printed in the Philosophical Transactions, showing that the bones of the sternum resemble those of the ornithorhynchus paradoxus.* By Sir EVERARD HOME, Bart. V. P. R. S.

Read January 22, 1818.

MY first account of the fossil bones of this most extraordinary animal attracted the notice of geologists, and collectors of extraneous fossils, and led Mr. JOHNSTON of Bristol, and the Revd. Mr. BUCKLAND of Oxford, to assist me with the materials in their possession, to make a farther progress in the description of its skeleton. An account of these specimens formed the substance of my second paper.

Since that time I have frequently communicated with these gentlemen, also with the Rev. PETER HAWKER of Woodchester rectory, Minchinhampton, and Dr. CARPENTER of Lyme; and have received from them many specimens I had not seen before, some of which it was difficult to determine to what part of the skeleton they belonged: but that being ascertained, and a similarity discovered to bones of the ornithorhynchus paradoxus, that circumstance alone made them, in my opinion, of sufficient importance to become the subject of a third communication to this Society.

There is also another reason for bringing forward these facts, and for doing so without any unnecessary delay; for, as my former papers were the means by which I acquired them, their being made known to the public, may lead those

gentlemen who have opportunities of examining the cliffs in which the bones are found, to renew their labours, and assist in making out all the essential parts of the skeleton.

In the description I am to give of the bones received, I shall begin with one, a part of which is shown lying on the scapula in Mr. BULLOCK's specimen, engraved in the first Paper; it was then taken for the portion of a rib accidentally brought there, but it is now found to have been nearly in its natural situation. It bears a resemblance to the clavicular bone in birds. In the annexed engraving (Pl. II. Fig. 1.) it is shown in its relative situation to the other bones.

The bones of which the sternum is composed, are the next to be taken notice of: this part of the skeleton was first pointed out by my friend Mr. BUCKLAND, who had visited every collection in which bones of this animal were known to be preserved; he met with several specimens in which two flat bones were united together, and their union covered by a bone not unlike the upper bone of the sternum in quadrupeds, which made him believe that all the three formed part of the sternum. These different specimens, at his request, were sent to London for my inspection, and Mr. BUCKLAND's suggestion proves to be right.

This discovery of the sternum destroys the analogy between this animal and the cartilaginous fishes, which, while the materials were more scanty, I had been led to suspect, in consequence of the bones of the pectoral fin of the squalus having a greater degree of correspondence to the pectoral fin or paddle of the fossil animal, than any other bones I have examined.

As this form of the sternum appeared at the time quite new, I was very anxious not to fall into an error, and was re-examining, with Mr. CLIFT, the different specimens, when it struck him that there was something similar to this mechanism in the sternum of the *ornithorhynchus paradoxus*: this remark led to a comparison of the bones, and they were found to have a general agreement that could not have been expected.

In the *ornithorhynchus*, the first bone of the sternum, at its upper end, has two lateral processes, which are connected with a similar process from each of the scapulæ; underneath the first bone are two flat bones united together, which union is covered by the first bone. On the outer edge of these flat bones, there is a broad process continued down from the scapula; in this process is the hollow to which the first bone or os humeri of the pectoral fin is articulated.

It will be seen that the difference between these bones of the sternum in the fossil skeleton and that of the *ornithorhynchus*, consists in the fossil skeleton having a clavicular bone, which is wanting in the other; and the *ornithorhynchus* having a long process from the scapula, in which is the cavity of the shoulder joint, wanting in the fossil skeleton. These slight differences are not readily perceived in looking at the parts, as will be seen on inspecting the annexed engravings, Pl. II. Fig. 1, and 2.

The mechanism which has been described, gives a very unusual surface for the muscles attached to the sternum, which move the first bone of the pectoral fin; and upon examining them in the *ornithorhynchus*, I find there is not only

the great pectoral muscle, going from the first bone of the sternum to the first bone of the pectoral fin, and a small one under it which may be called the small pectoral muscle ; but two large muscles, which have their origin from the flat bones and go to the first bone of the pectoral fin, or os humeri, and are inserted just below its head, that part being unusually broad, to allow of sufficient surface for their attachment. These muscles must be considered as peculiar to those animals that have this particular form of sternum.

As these muscles probably belonged to the animal whose fossil bones are under consideration, as well as to the ornithorhynchus, I have given them a particular description.

Till the sternum was discovered, it could not be ascertained in what manner the animal breathed ; and the ribs being attached to the middle part of the vertebræ, as in fishes, made me lean to the opinion that it breathed water ; but I now find, on more attentive consideration, that there is a difference between the mode of attachment of the ribs in this animal and in fishes, which admits of their having the motion of elevation and depression required in breathing air. In fishes, the attachment is single ; but here, as is shown in the engravings in a former paper, it is double ; and the two are considerably apart, as in the bird. Till it was determined whether the animal breathed air or water, little attention was paid to the nostrils, further than to find their place on the skull ; more particularly as in the only head I had seen, the bony scales of the opposite eye had been pushed through an aperture situated where I considered the opening of the nostril must have been : but I

believed that the natural appearance of the orifice had been entirely destroyed. I have, since that time, through the favour of Mr. DELABECHE, of Lime, received a very accurate drawing of a fossil skull of this animal, in his possession, in which the apertures of the nostrils are very distinct ; and he informs me that in all the skulls he has seen, the orifices are of the same size, and similar to that engraved in my first paper ; so that there now can be no doubt respecting the real shape and size of the aperture which corresponds to that in birds ; and as in birds there is no bony septum narium, the bony plates of the opposite eye being so distinctly seen behind the aperture, is readily understood.

To find any analogy between the bones of animals now alive, and those of animals so long extinct, that they must be considered to belong to another order of beings, is matter of no small curiosity ; but to have discovered an analogy between the peculiarities met with in the bones of the animals of New Holland, by which they are so remarkably distinguished from all others that now inhabit our globe, and those of bones in a fossil state, not only creates a considerable degree of surprise, but at the same time, by connecting the present animals with those that are extinct, adds one to the intermediate links of the chain of gradation which must prove the most interesting to the comparative anatomist and the geologist.

The animal whose fossil skeleton we have been considering, is ascertained by the form of the vertebræ, to swim like a fish ; and from the shape of its chest must breathe air ; its constant residence must also be in the water. The ornitho-

rhynchus paradoxus, from the form of its vertebræ, swims like the whale tribe, and breathes air, but does not, like them, reside constantly in the water, as no animals covered with hair do.

As neither fishes, nor animals of the whale tribe, have any thing in the form of the sternum, or of the muscles that are attached to it, that is similar to what is met with in the fossil animal and ornithorhynchus, these last animals, in that respect, make an approach to the bird, in which the sternum has still greater breadth, and the muscles greater strength.

In finding that this structure of sternum is wanting in the whale tribe, it leads to an enquiry into the peculiarities of the habits of life of the ornithorhynchus, and the animal to which the fossil bones belonged, that make such a structure necessary.

The ornithorhynchus has its fauces and stomach commonly filled with sand and gravel, which renders it probable that it feeds at the bottom of the lakes and rivers in which it is met with ; and as it must come to the surface to breathe at short intervals, this apparatus will enable it to rise with an unusual degree of velocity ; and would answer the same purpose in the animal whose sternum has a similar construction. Nothing of this kind is required in the whale tribe ; they are rendered sufficiently buoyant by the oil they contain.

There is a fossil bone found in the same place, having so nearly the same colour and general structure as those of this animal, that it seems to belong to it. In its form it bears a resemblance to the first bone of the pectoral fin, only much larger in all respects, it therefore may be conjectured to be

the first bone of the posterior fin, should the animal have had one ; but till bones like those of the pelvis are found, this cannot be determined. It is engraved in Plate III. that it may be generally known, and by that means its place in the skeleton will be sooner ascertained.

The bones of the pectoral fin of the fossil skeleton, bear no resemblance to those of the onithorhynchus, but have some faint likeness to those of the pectoral fin of the shark. The bones of the pectoral fin of the ornithorhynchus correspond with those of the same fin in the whale tribe, turtles, the bones of the wings in birds, and of the fore leg of the quadruped. It would appear from the variety that occurs among the different specimens which have come under my observation, that the fossil bones met with at Lyme, not only belonged to animals of different sizes, but of different species. I am led to this opinion from Mr. DELABECHE having sent me two sets of the bones of the pectoral fin which evidently belonged to the same animal, in which the small bones of the paddle are set on to the long bone in a manner somewhat different to what it is in the others.

EXPLANATION OF THE PLATES.

PLATE II.

Contains two figures; the first represents the different parts that compose the sternum, in the fossil animal, and their connection with the neighbouring bones; the second the corresponding bones in the *ornithorhynchus paradoxus*, to show their resemblance.

Fig. 1. The sternum, and bones connected with it, in the animal whose bones are found in a fossil state.

aa Two flat bones peculiar to the sternum of this animal and the *ornithorhynchus*.

b A flat bone behind which is concealed the union of the edges of the two flat bones just mentioned.

cc Two processes from this bone, by means of which it is united to the scapulæ.

dd The two scapulæ, which, united to the flat bones, form the glenoidal cavities of the shoulder joints.

eee A slender curved bone crossing the upper end of the sternum, and uniting the two scapulæ together.

ff The two first bones of the pectoral fin or paddle.

Fig. 2. The sternum and scapulæ in the *ornithorhynchus paradoxus*.

aa Two flat bones nearly similar to those in Fig. 1. united to the scapulæ, but making no part of the glenoidal cavity of the joint of the shoulder.

b The bone corresponding to that marked *b*, Fig. 1.

cc Two processes similar to those in Fig. 1.

dd The two scapulæ which differ from those in Fig. 1. by extending below the two flat bones, and forming the whole of the glenoidal cavity of the shoulder.

g h i j Four bones belonging to the sternum.

All the parts are of the natural size.

PLATE III.

The representation of a fossil bone of the natural size, which appears to belong to the same animal. Its place in the skeleton cannot at present be ascertained, since it is not yet known whether in this animal there is a regular pelvis. It bears a greater resemblance to the first bone of the paddle than to any other ; so that if the animal has a posterior paddle, this must belong to it.



